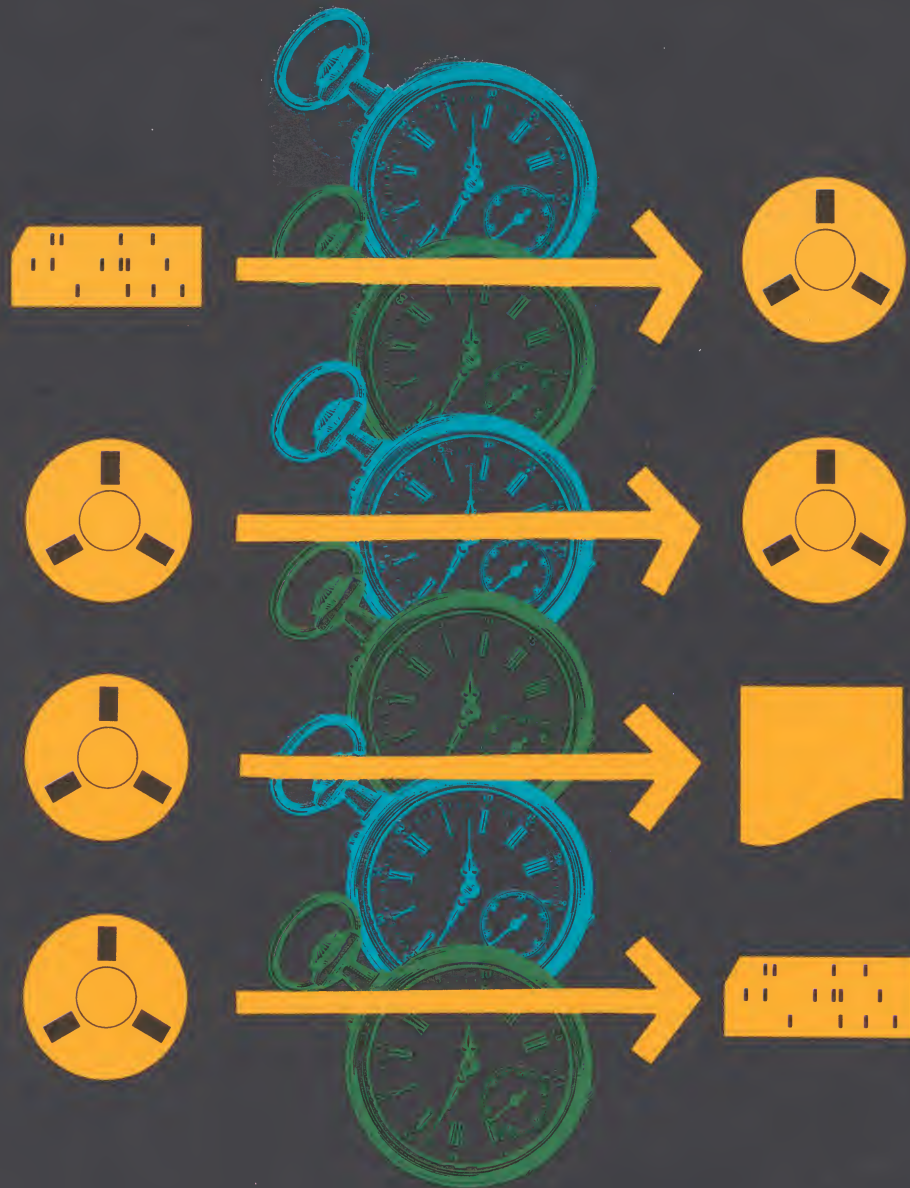


True Simultaneity

Improves Cost/Performance on Medium-Scale Computers



GENERAL  ELECTRIC



Every computer user who processes large volumes of paper has talked about the advantages that simultaneity would give him — if he had it on his computer. No more time-killing sequential processing. No more lost time waiting for the slowest peripheral. No more dead time while moving in the next job. But, like the weather, everyone talks about it — no one does much about it.

Now every user of GE-200 computers can have true simultaneity because the State Government of Iowa and General Electric *did* do something about it! What's more, they accomplished it in an environment usually reserved for large-scale computers. They did it on one of General Electric's medium-scale machines — a GE-225. As a result, Iowa increased its processing capacity by 60 percent, and significantly reduced its cost-per-application. And, they were able to replace two popular computers of another make.

Key Considerations

They did it by taking full advantage of the GE-225's API (Automatic Priority Interrupt) option which allows all peripherals to run at top efficiency without significantly slowing down or reducing the computational power of the central processor. And, by means of a unique executive routine (the API Executive System) which controls and manipulates these functions simultaneously, allowing the programmer to program the application, not the computer.

For example, the powerful API Executive System at Iowa lets the GE-225 update files on magnetic tape while placing card data on tape; transfer data from tape to cards; and perform production printing at a rate of 900 lines per minute. *True multi-processing on a medium-scale computer!*

Traditionally, processing speed can be no faster than the rated speed of the slowest peripheral. The computational speed of the central processor is infinitely faster than, say, the operation of a card reader. Where large amounts of paper processing are involved, the invariable result is that the computer becomes input/output bound. To overcome this severe detriment — a central processor should not, and need not, be victim of its own peripherals — the obvious answer is multi-processing carried out simultaneously. Iowa and General Electric believed this was possible *without* incurring the high cost of a large-scale computer designed specifically with multi-processing capabilities. They tried, and succeeded with benefits that went even beyond their original concepts.

Using API and The Executive System

Using the full power of these important tools, Iowa can perform *any* card-to-tape, *any* tape-to-tape, *any* tape-to-punch, and *any* tape-to-printer operation *simultaneously* without prior testing of the combination.

Technically, this is how it works. In API, all primary application programs are tape-to-tape. Input/output functions are API controlled. Card input is received via a card image tape written by the card-to-tape function at a rate of 900 cards-per-minute. Printer output is on a tape-to-printer tape to be printed via the tape-to-printer function at 900 lines-per-minute on a scheduled, when-required basis. Punched card output is also on tape for later input to the tape-to-card function and punched out at 100 cards-per-minute.

Briefly, each peripheral controller connected to the GE-225 (plus the card reader and card punch) generates a signal to the central processor indicating that it has finished an input/output operation and is "ready for another instruction." While primary programs are being processed, peripherals are operated at rated speed. Primary programs proceed at tape or processing speed. Programming is simplified in that the programmer need not concern himself with direct peripheral operation, error recovery, and associated timing requirements.

Minimum hardware requirements include any of the Compatibles/200 or Compatibles/400 with:

- 8192 words of core memory
- API (optional on the Compatibles/200 — built-in on the Compatibles/400)
- BCD Hardware Option
- MOV Instruction Hardware Option
- High-speed Printer
- 1 Tape Controller
- 3 Dual Tape Handlers



Programs

Programs can range from small to large volume and from simple to complex problems. For instance, Iowa runs upwards of 1000 programs including:

- Issuing and paying over 2-million warrants a year.
- Calculating and paying over one half-million gas tax refund checks and claims a year.
- Auditing and calculating income and sales taxes.
- Producing test charts and reports for Brucellosis and Tuberculosis for over 190,000 Iowa farmers.
- Auditing call reports and producing statistics from bank statements.
- Processing legislative status and indexing information.
- Processing license applications.
- Tabulates census of wildlife.

These are representative applications and merely show the variety, extent, and complexity of problems solved by Iowa.



Application Benefits

One application — the redemption of state warrants (checks drawn on the State of Iowa — Iowa acts as its own bank) for the Treasurer — saves the State Government over \$60,000 annually. Here's how they accomplish this.

Iowa has found that electronic data processing not only permits the user to do more work, but in some cases, it also makes it possible to get others to do more work for you. For example, five years ago, the process of issuing, redeeming, and keeping track of state warrants was handled manually. Warrants were cashed at local banks, then returned to the state, where they were balanced by bank, sorted by account number, re-added and checked to total. Later the state converted to unit record equipment and began processing its redeemed warrants automatically.

Now, with the GE-225, Iowa has reduced its warrant redemption costs tremendously by devising an unusual system in which three state-selected "clearing banks" do the bulk of the State's warrant processing free of charge.

At the time a warrant is printed (on continuous, pre-numbered warrant forms) the warrant number is imprinted in the "on-us" area of the document. Any bank will honor the warrant, but each must then clear its warrants through the current clearing bank. There, the warrants are computer processed. (Incidentally, one of the clearing banks — Iowa-Des Moines National Bank — uses a GE-225 in its banking business). A magnetic tape containing all of the necessary warrant information is produced by the bank and returned to the State with the cashed warrants. This tape is used on the State's GE-225 to update all warrant records and to produce a redemption register showing the day's transactions.

The new procedure has cut the State's warrant redemption cost from \$24 per thousand warrants to \$4.35 per thousand. It is estimated that the processing done by the clearing banks thus saves the State nearly \$49,000 a year in redemption costs alone. By returning to a paper warrant, rather than a punched card warrant, Iowa saves through the elimination of expensive key punching plus an estimated \$13,000 a year (50 percent) in the cost of the warrants.

Overall, the multi-processing capability of the General Electric computer will save the State \$70,000 annually in lease costs over any other systems that were proposed.

Added Capability Through API Simultaneity

All of the activities at Iowa were accomplished at their significant time and cost savings because of Iowa's ability to do four things at once. In all probability your business can profit by this capability, too. The beauty of it all is that you don't need to make a huge capital outlay to enjoy the benefits.

If you now have a Compatibles/200 computer without the API hardware option, \$75.00 a month will give you the same capability that Iowa has. GET, the General Electric user's group, will supply the API Executive System (at no cost to you) — and you're on the air. If you already have the API hardware option, why not take *full* advantage of it?

If you're considering a Compatibles/400 machine, API hardware is built right into it. Simultaneity capabilities are instantly available — all you have to do is ask General Electric's Computermen for the Executive System.

General Electric's trained experts at any of the listed District Offices can help solve your problems and help make your data processing as profitable as Iowa's. Just call the office nearest you or write or call the Computer Department, Phoenix, Arizona.



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